Point Wolfe River Atlantic Salmon Rehabilitation: Fall-Fingerling Stocking by Helicopter, 1982 - 83

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POINT WOLFE RIVER ATLANTIC SALMON REHABILITATION: FALL-FINGERLING STOCKING BY HELICOPTER, 1982-83

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1. Resource Conservation
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ABSTRACT

Semple, J.R., and G. Mercer. 1987. Point Wolfe River Atlantic salmon rehabilitation: fall-fingerling stocking by helicopter, 1982-83. Can. MS Rep. Fish. Aquat. Sci. No. 1918. v + 7 p.

As part of the Point Wolfe River Atlantic salmon recolonization, a stocking rationale and implementation plan was developed and the distribution equipment and procedure are described. Approximately 42,000 fall-fingerling Atlantic salmon were released from a helicopter in each of two years, 1982 and 1983. Sixteen sites, averaging 4.8 km in 1982 and 5.3 km in 1983 from the staging area at Bennett Lake, were stocked in an average of about two and a half hours of flying time. Tank loading rates averaged 2,650 fish (41 g/L) and 2,625 fish (44 g/L) in 1982 and 1983, respectively. Loads ranged from 1,060 fish (16 g/L) to 2,960 fish (47 g/L). Mortality was not observed after stocking and the fish dispersed readily to cover.

Key words: Atlantic salmon, fall fingerlings, stocking rationale, rehabilitation, helicopter, Point Wolfe River, Fundy National Park.

RÉSUMÉ

Semple, J.R., and G. Mercer. 1987. Point Wolfe River Atlantic salmon rehabilitation: fall-fingerling stocking by helicopter, 1982-83. Can. MS Rep. Fish. Aquat. Sci. No. 1918. v + 7 p.

Dans le cadre du repeuplement de la rivière Point Wolfe en saumon de l'Atlantique, un programme d'ensemencement avec exposé de principes a été mis au point. La méthode et l'équipment qui ont été utilisés sont décrits dans le présent document. Chaque année, en 1982 et 1983, environ 42 000 tacons d'automne ont été relachés par hélicoptère. Seize sites, situés à environ 4,8 km en 1982 et à 5,3 km en 1983 de la zone de transition du lac Bennett, ont été ensemencés pendant une durée moyenne de vol d'environ deux heures et demie. Le taux de chargement moyen des réservoirs a été de 2 650 poissons (41 g/L) en 1982 et de 2 625 poissons (44 g/L) en 1983. Le contenu des réservoirs a varié de 1 060 poissons (16 g/L) à 2 960 poissons (47 g/L). Aucune mortalité n'a été observée après l'ensemencement et les poissons se sont vite dispersés à la recherche d'un abri.

INTRODUCTION

The Point Wolfe River is located in southern New Brunswick and flows through Fundy National Park to meet the Bay of Fundy near the mouth of Chignecto Bay. The river has a 129-km^2 drainage area, which consists of about 47 km of stream length, including tributaries, and has a headwater elevation of 380 m. The river flows southeasterly through several large cutover blocks in its headwaters, and thence through a deep, unspoiled valley within the park. During the ice-free season, the river water is slightly acid (mean pH = 6.52) and relatively low in conductivity (38.6 mhos/cm)(Kerekes and Schwinghamer 1978; Alexander and Galbraith 1982).

Historically, the Point Wolfe River supported a natural population of Atlantic salmon. However, existing and previous mill dams, located near the river mouth, prevented access and eliminated the native salmon population.

The most recent biological assessment indicated a full-production potential contribution of more than 1,300 adult salmon annually to all fisheries and to spawning escapement. To achieve this end, a cooperative plan was prepared by the Department of Fisheries and Oceans and Parks Canada to reestablish a natural population (Alexander and Galbraith 1982). While several methods of recolonizing the river with salmon were considered by Alexander and Galbraith (op. cit.) - natural straying; adult transfers, stocking of smolts, fry and fall fingerlings - the latter technique was considered most feasible. Fish passage around the existing dam at the river mouth was provided by Parks Canada in 1984 and the first returns of adult salmon were expected in 1985.

The purpose of this report is to describe the salmon distribution plan that was developed and to document the stocking which occurred during 1982 and 1983. Because of poor road access to salmon rearing habitat, conventional fish stocking by hatchery vehicle was considered impractical. Therefore helicopters were used to release fish in appropriate locations throughout the river. This stocking technique has seldom been used in the Scotia-Fundy Region, hence it was deemed worthwhile to publish a description of the method.

METHODS AND EQUIPMENT

Fish were distributed by means of a Bell 206B helicopter carrying a 416-L "Water Buoy" water bucket, manufactured by Hawkins and Power Aviation Limited. During both years, Bennett Lake picnic ground was chosen as the staging area for fall-fingerling salmon stocking because it is located near the mid-reaches of the river. Coastal fog is less prevalent at this location and the landing area is good. For safety reasons and to prevent disturbance from picnickers and tourists, the road into the staging area was barricaded.

The fish distribution team consisted of a helicopter pilot (contracted), a navigator, a ground coordinator and nozzleman, a pump operator and a statistician from Parks Canada's Warden Service, and two fish culture personnel from the Department of Fisheries and Oceans. All equipment except the hatchery truck and fish were supplied by Parks Canada.

The hatchery vehicle was parked near the lake shore and a Wajax water pump was used to fill the bucket. It was filled to only about two-thirds of capacity to avoid possible splash-over and fish loss during helicopter transport to the release sites. The desired number of fingerlings was then removed from the hatchery vehicle and added to the water bucket as the helicopter hovered overhead. The proper number of fish was obtained by weighing and was based on the known average weight of individual fish established beforehand. When ready, the ground coordinator signaled the pilot to proceed to the release site. A Parks Canada official accompanied the pilot and acted as navigator. The release site number and round-trip flying time were radioed back to the statistician who kept a record of when and how many fish were stocked at each site. Upon arrival at the release site, the helicopter descended until the water bucket was within a few centimetres of the water surface, whereupon the navigator signaled the pilot to open the bucket doors and release the fish. The expected return time was radioed back to the staging area and the whole procedure was repeated until all fish had been released.

A standby water pump and fire bucket were assembled at the staging site in case of equipment malfunction.

THE DISTRIBUTION PLAN AND RATIONALE

The rationale for the fish distribution plan was that it would not be beneficial to release underyearling salmon at pre-dispersal densities of less than 5,000/83.6 m^2, or per individual release site, since the fish will disperse about 1.6 km downstream and 0.8 km upstream from the release site; and, "given this start, as many will survive as if they had been dispersed more widely" (Elson 1957 and 1975). Without control of fish-eating birds, underyearling salmon stocked to give post-dispersal densities of about 12-24/100 m^2 should produce maximum smolt output without undue wasteage of hatchery stock (Elson 1962). Based on smolt production estimates for the nearby Big Salmon River (Jessop 1975), such a stocking scheme should yield about four smolts/100 m^2 of salmon habitat.

The stocking requirement to achieve a total or full seeding with smolts was based on a fall-fingerling-to-smolt survival rate of about 16 percent. This is slightly lower than that assumed by Alexander and

Galbraith (1982) and is based on survival rates of fall-fingerling salmon stocked in inaccessible areas of the Nepisiguit River (Semple, unpublished).

Based on the estimate of 1,706 units (100 m^2) of salmon habitat in Point Wolfe River (Alexander and Galbraith 1982), total smolt potential is about 6,800. The numbers of fall fingerlings required to produce that number of smolts is about 42,000.

The above estimates and rationale were used to derive the stocking plans presented in Table 1. The numbers of fall fingerlings for release in each of the three river segments are proportional to the estimated numbers of salmon habitat units in each, and the numbers of release sites per river segment are such that post-dispersal fingerling density will be about 24/100 m^2.

Four annual releases of about 42,000 fall-fingerling Atlantic salmon were made. The last release was completed in 1985. Fingerlings for the 1985 planting, as for the previous releases which began in 1982, were reared at Saint John Fish Culture Station and originated from broodstock collected in Big Salmon River.

SALMON RELEASED

Fingerling releases in 1982-83 were made in mid- to late September at rates of about 42,000 fish annually (Tables 2 and 3). Fish planted in 1982 were slightly smaller than those released in 1983 and averaged 234/kg and 214/kg, respectively. The stocking locations are shown in Figs. 1 and 2, together with the planting sequence, numbers stocked and the round-trip flying time to the staging area at Bennett Lake.

In 1982, stocking began at the upriver sites because of coastal fog, but in 1983, it began at the river mouth and proceeded upstream.

Owing to an accidental release of fish into Bennett Lake in 1982 (Site 19), more fingerlings than planned were released in River Segments 1 and 2 and fewer in River Segment 3 (Tables 1 and 2). Stocking in 1983 followed fairly closely the plan that was developed (Tables 1 and 3).

For combined release sites, round-trip flying times averaged 9.2 minutes (9.7 km) in 1982 and 9.9 minutes (10.6 km) in 1983 (Tables 2 and 3). The longest trip was 14 minutes (15.8 km). Fish loads in the transport container ranged from a maximum of 2,960 to a minimum of 1,060. The largest biomass density of fish carried to a release site in one load was 47 g/L, and it averaged 41 g/L in 1982 and 44 g/L in 1983. The maximum biomass of fingerlings carried to a release site in one trip was 13.084 kg. It averaged 11.325 kg in 1982 and 12.266 kg in 1983 (Table 4).

DISCUSSION

The use of helicopters proved to be a very efficient means of distributing fall-fingerling salmon in the Point Wolfe River. Because of very limited road access and topography of the river banks, it was the only feasible way of widely distributing fish and ensuring their survival.

A helicopter and customized fish transport container system has been used in British Columbia for distributing steelhead, Salmo gairdneri, fry. The transport device consisted of a series of aerated containers, which could be emptied individually, and which were suspended on a 30-m cable. Fish of 1 g-5 g have been loaded as heavily as 400 g/L for over 30 minutes without any overt signs of stress (Anon 1983). The container system described in the present report is an off-the-shelf unit commonly used for fighting forest fires and has no water-aerating capability. For short flying distances and at the loading rates used during the this stocking, the present method was successful. Casual observations of fish released a few centimetres above the water surface revealed no mortalities and the fish quickly "evaporated" into the gravel river bottom.

Although no aeration system was employed in the present study, one may be required if longer flying times or higher loading densities are required. A series of individual fish-transport containers would increase the efficiency, as it would then be possible to release fish at several sites before returning to the staging area. Nevertheless, the Point Wolfe River results show that approximately 42,000 fall fingerlings can be distributed at sixteen release sites, ranging from 4.8 to 5.3 kilometres from a staging area, in about two and one-half hours of flying time. The task can be completed in about three and one-half hours when time for weighing and loading the fish and refuelling the helicopter is included.

During 1982, both "Water Buoys" malfunctioned, necessitating an unplanned release of fish by hand at Site 19 near the outlet of Bennett Lake. It is recommended that a standby water bucket be provided in future, in case of a similar malfunction. On one occasion during the 1982 distribution, guy-lines attaching the water bucket to the helicopter became entangled and caused the container to tip over at liftoff. Rather than injure the fish by replacing them in a container, they were hosed into Bennett Lake. Precautions should be taken to ensure that guy-lines are free before liftoff. No mishaps occurred during 1983 operations. It is recommended that two-way radio communication between the helicopter and staging area be continued in subsequent years to facilitate ground preparations at the staging site, and accurate and timely recording of data.

TABLE 1. Distribution plan for fall-fingerling Atlantic salmon in Point Wolfe River.

River segment	Segment boundaries	Number of 100-m^2 rearing units[1]	Percentage of total area	Number of release sites	Numbers to stock		
					Per site	Per rearing unit[2]	Totals
1	Main stem, from the river mouth to confluence of east branch	1,062	62.3	10	2,620	25	26,200
2	Bennett Brook, from confluence with main stem to falls on Bennett Brook	49	2.9	1	1,200	24	1,200
3	Main stem, from confluence with east branch to headwaters	595	34.8	5	2,960	25	14,800
Totals		1,706	100.0	16			42,200

1. Alexander and Galbraith (1982).
2. Approximate post-dispersal density.

TABLE 2. Fall-fingerling Atlantic salmon distributions by helicopter in the Point Wolfe River, Fundy National Park, New Brunswick, 1982.[1]

River segment, number and boundaries	Site number	Site location		Planting sequence[3]	Numbers stocked	Round-trip[2]	
		Military grid ref.	Lat. Long.			Flying time (min.)	Distance (km)
1 Main stem, from the river mouth to confluence of east branch	1	426471	45°34' 65°01'	12	2,654	11	15.8
	2	422475	45°34' 65°02'	6	2,654	12	14.6
	3	418479	45°34' 65°02'	7	2,654	11	13.6
	4	408482	45°34' 65°03'	8	2,654	10	12.2
	5	404484	45°34' 65°03'	11	2,654	10	11.6
	6	398494	45°35' 65°03'	9	2,654	8	9.6
	7	387495	45°35' 65°04'	13	2,654	8	8.8
	8	378499	45°35' 65°04'	14	2,654	13	8.0
	9	372502	45°35' 65°05'	15	2,654	10	7.6
	10	352504	45°35' 65°07'	3	2,960	11	8.8
Subtotal					26,846	$\bar{x}$=10.4	$\bar{x}$=11.1
2 Bennett Brook, from confluence with main stem to falls on Bennett Brook	15	376507	45°35' 65°05'	--	No stocking	-	-
	16	373513	45°35' 65°05'	--	No stocking	-	-
	18	378543	45°37' 65°05'	10	2,654	0	0
	19	379540	45°37' 65°05'	16	1,060	4	0.4
Subtotal					3,714	$\bar{x}$=2.0	$\bar{x}$=0.2
3 Main stem, from confluence with east branch to headwaters	11	340506	45°35' 65°07'	1	2,960	10	9.6
	12	329508	45°35' 65°08'	5	2,960	10	11.0
	13	323511	45°35' 65°08'	4	2,960	11	11.6
	14	315515	45°36' 65°09'	2	2,960	8	12.6
	17	337551	45°38' 65°08'	-	No stocking	-	-
Subtotal					11,840	$\bar{x}$=9.8	$\bar{x}$=11.2
Total					42,400	$\bar{x}$=9.2	$\bar{x}$=9.7

1. All fish were stocked on September 14.
2. From staging area at Bennett Lake to the stocking site; distance is straight-line distance.
3. Planting sequence = the order in which the sites were stocked.

TABLE 3. Fall-fingerling Atlantic salmon distributions by helicopter in the Point Wolfe River, Fundy National Park, New Brunswick, 1983.[1]

River segment, number and boundaries	Site number	Site location: Military grid ref.	Site location: Lat.	Site location: Long.	Planting sequence[3]	Numbers stocked	Round-trip[2]: Flying time (min.)	Round-trip[2]: Distance (km)
1 Main stem, from the river mouth to confluence of east branch	1	426471	45°34'	65°01'	1	2,600	14	15.8
	2	422475	45°34'	65°02'	3	2,600	12	14.6
	3	418479	45°34'	65°02'	2	2,600	10	13.6
	4	408482	45°34'	65°03'	4	2,600	10	12.2
	5	404484	45°34'	65°03'	5	2,600	10	11.6
	6	398494	45°35'	65°03'	6	2,600	8	9.6
	7	387495	45°35'	65°04'	7	2,600	10	8.8
	8	378499	45°35'	65°04'	8	2,600	8	8.0
	9	372502	45°35'	65°05'	9	2,600	9	7.6
	10	352504	45°35'	65°07'	10	2,600	10	8.8
Subtotal						26,000	$\bar{x}$=10.1	$\bar{x}$=11.1
2 Bennett Brook, from confluence with main stem to falls on Bennett Brook	15	376507	45°35'	65°05'	-	No stocking	-	-
	16	373513	45°35'	65°05'	16	2,000	6	5.8
	18	378543	45°37'	65°05'	-	No stocking	-	-
	19	379540	45°37'	65°05'	-	No stocking	-	-
Subtotal						2,000		
3 Main stem, from confluence with east branch to headwaters	11	340506	45°35'	65°07'	12	2,800	9	9.6
	12	329508	45°35'	65°08'	13	2,800	13	11.0
	13	323511	45°35'	65°08'	15	2,800	10	11.6
	14	315515	45°36'	65°09'	14	2,800	11	12.6
	17	337551	45°38'	65°08'	11	2,800	8	7.8
Subtotal						14,000	$\bar{x}$=10.2	$\bar{x}$=10.5
Total						42,000	$\bar{x}$=9.9	$\bar{x}$=10.6

1. All fish were stocked on September 16.
2. The staging area was located at Bennett Lake picnic grounds (Fig. 1); distance is the straight-line distance.
3. Planting sequence = the order in which the sites were stocked.

TABLE 4. Mean, minimum, and maximum numbers and densities per load of fall-fingerling Atlantic salmon transported by helicopter to release sites in Point Wolfe River, New Brunswick, 1982-83.

Year	Item	Mean	Minimum	Maximum
1982	No. of fish	2,650	1,060	2,960
	Biomass/vol (g/L)	41	16	46
	Biomass (kg)	11.325	4.530	12.650
1983	No. of fish	2,625	2,000	2,800
	Biomass/vol (g/L)	44	34	47
	Biomass (kg)	12,266	9.346	13.084

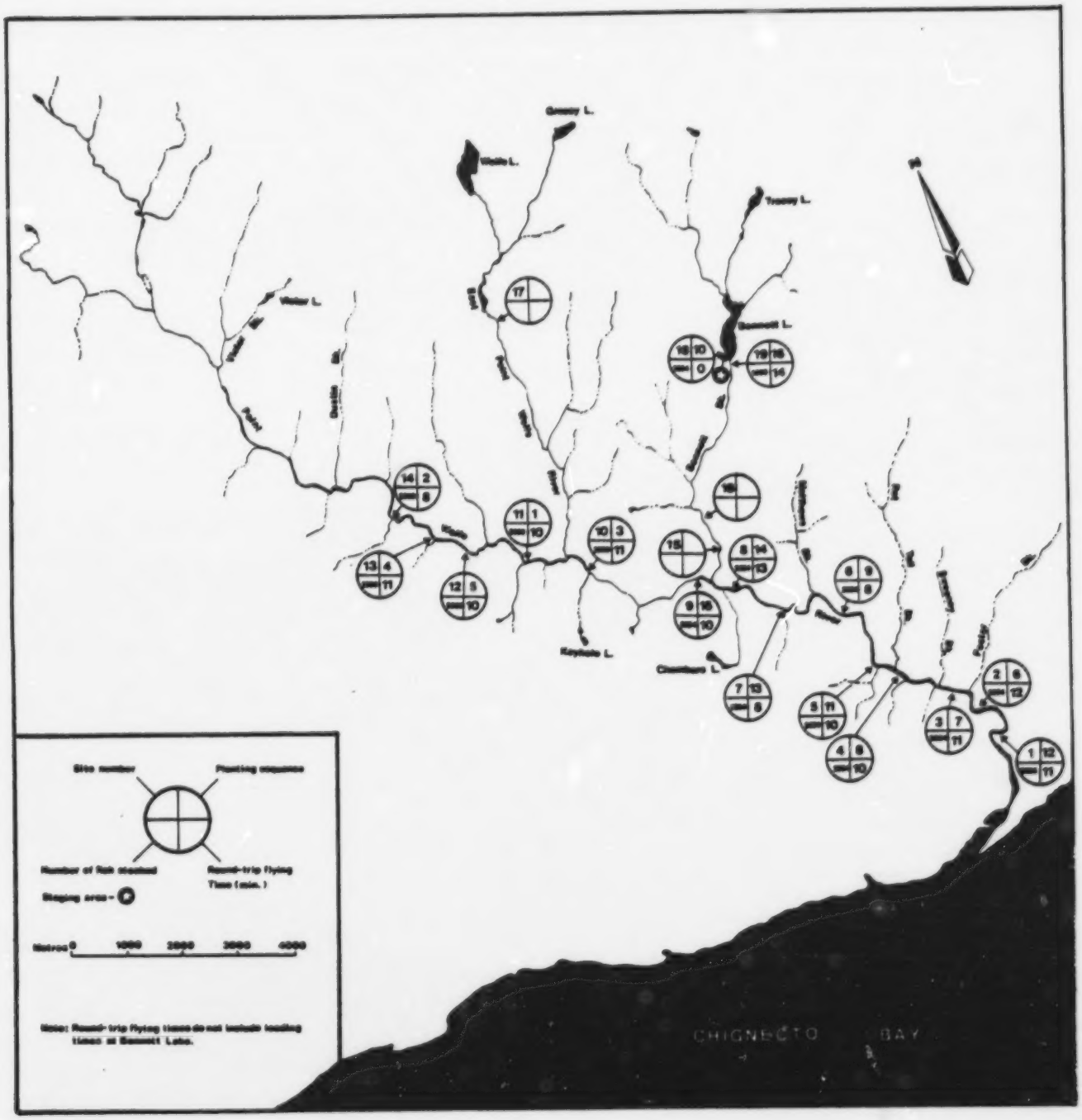

FIG. 1. Fall-fingerling Atlantic salmon distributions by helicopter in the Point Wolfe River, Fundy National Park, New Brunswick, 1982.

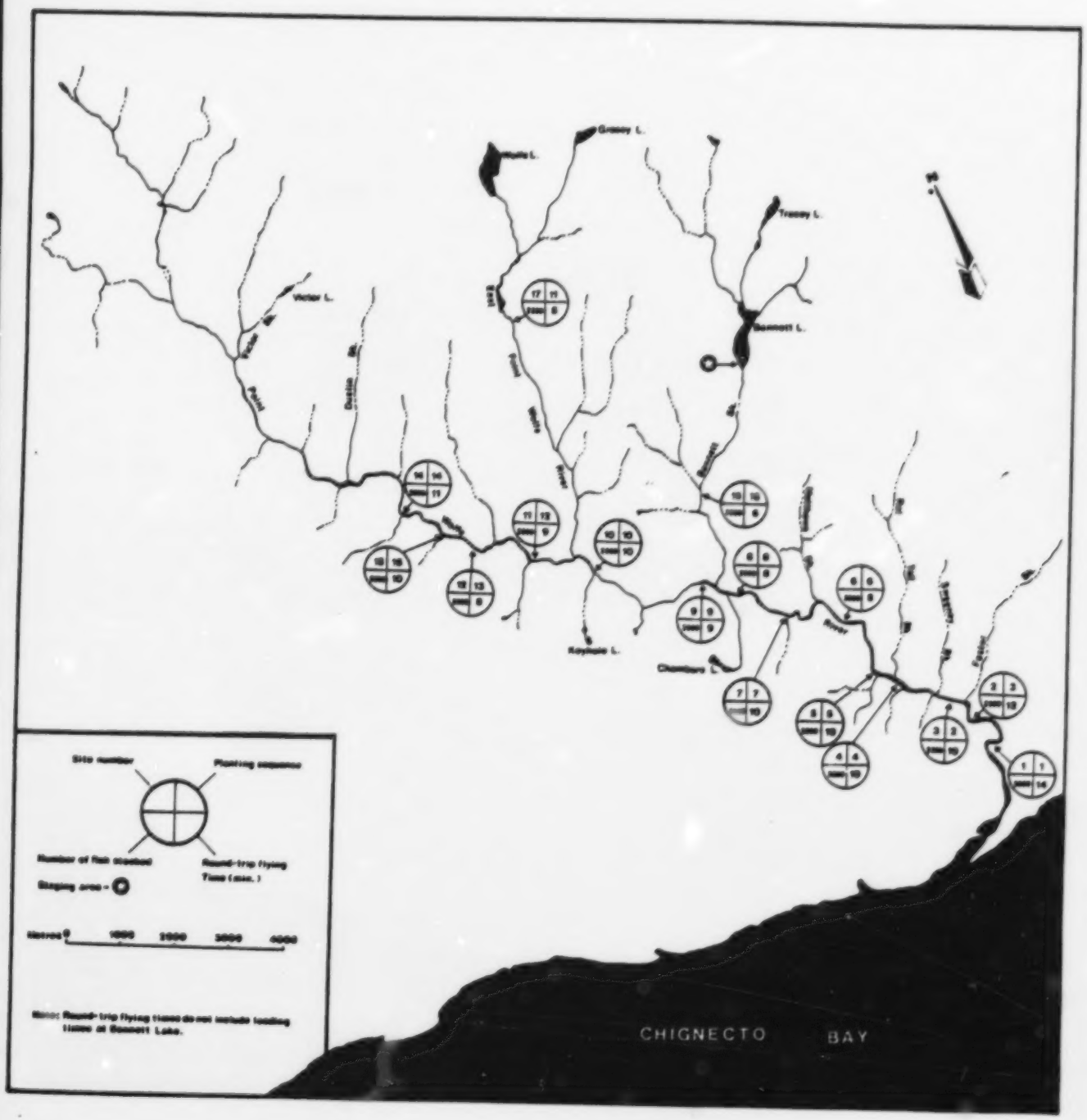

FIG. 2. Fall-fingerling Atlantic salmon distributions by helicopter in the Point Wolfe River, Fundy National Park, New Brunswick, 1983.

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